Addenda Manual
Model DS-350
Digital Thermocouple
DORIC

MANUAL ADDENDA

This package of addenda is a supplement to the Model DS-350, Digital Thermocouple Indicator, Owner's Manual.

Included are:

350-4380-00	Self Calibration Option
350-4390-01	Temperature Transfer Standard Option
350-4400-00	Analog Output Option
350-4410-00	Extra Filter Option
350-416X-0XF	Option Board Assembly, DS-350
350-6160-02C	Schematic Options, DS-350

MANUAL ADDENDUM 350-4380-00

MODEL DS-350, DIGITAL THERMOCOUPLE INDICATOR

SELF CALIBRATION OPTION

The self calibration option provides a calibrated voltage to the input of the Model DS-350. The calibration voltage is applied when the self calibration button on the front panel is depressed. The full scale temperature for the instrument will be displayed on the panel and should be within ±1 degree of full scale. The source need not be removed when using the self calibration option.

Repeatibility, resolution and stability are the same as for the basic instrument.

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MANUAL ADDENDUM 350-4390-01

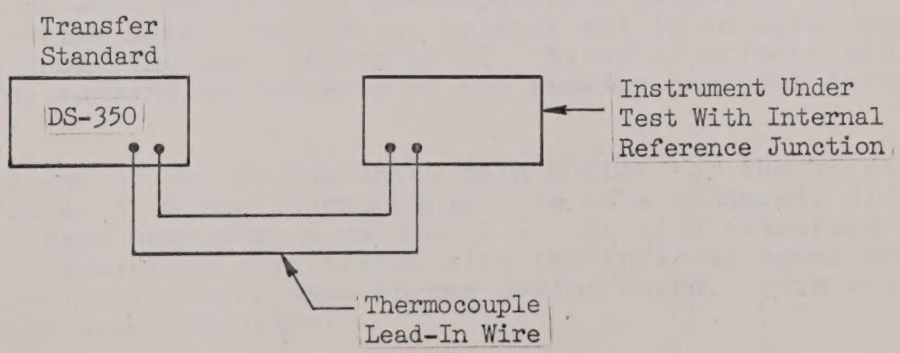
MODEL DS-350, DIGITAL THERMOCOUPLE INDICATOR

TEMPERATURE TRANSFER STANDARD OPTION

The temperature transfer standard option provides an adjustable, internal floating reference source capable of driving input impedances as low as 1K ohm. A locking type front panel pushbutton is provided to activate the option. Two front panel knobs, one coarse and the other fine, allow adjustment of the internal source, which measures and displays on the instrument readout, while simultaneously being applied to the unit being calibrated. The same thermocouple terminals on the rear of instrument are used for transfer function. Settability is limited only by resolution of the instrument.

The accuracy and stability of the option are the same as the basic instrument.

NOTE: When using this option as a calibration source for a thermocouple indicator with an internal reference junction, the interconnecting leads should be the same type of thermocouple lead-in wire as the type of thermocouple for which the indicator was designed.



MANUAL ADDENDUM 350-4400-00

MODEL DS-350, DIGITAL THERMOCOUPLE INDICATOR

ANALOG OUTPUT OPTION

The Analog Output Option is a plug-in card assembly that is in parallel to the input signal being measured by the DS-350. It provides an output on connector J1, pins 33 (Hi) and 34 (Lo). This output is directly proportional to the output of the thermocouple being measured and can be used to drive a floating or grounded analog indicator or recorder.

The output section of this option is powered by a floating power supply which is completely separate from the internal operating supplies of the main instrument. This feature enables the analog output to be used with grounded output devices.

The amplifier used in this option can be zeroed to within 1 mv, RTO at gains from 50 to 1000. The zero adjustment pot is located inside the front panel. Zero degrees F or C will equal zero volts at output. Full scale out is +10 volts and will correspond to plus full scale of temperature range. The gain adjustment, R40, provides an adjustment range of ±3% of the full scale setting. The initial adjustment of the gain is performed by a resistor selection corresponding to the gain desired. The resistor will be installed across two threaded screw-on terminals provided on the option board.

All connections to or from the analog outputs should be made with a two-wire plus shield coax (twisted shielded pair). If the recorder is guarded, the shield should be connected to the guard pin at the recorder. If the recorder is not guarded, the shield should be connected at the guard terminal at the rear of the DS-350 instrument.

The amplifier Z1 is a DC, bi-polar transistor input amplifier, which will amplify the thermocouple's output by about 40% of the total system gain. The offset trimpot R34 is adjusted at the factory to null-out the zero offset of Z1. External offsets are balanced out by summing in currents at the summing junction through the zero pot, R47.

Z2 and Z3 act as the unity gain buffer for the differential output signal from the thermocouple. Z4 is a balanced, differential output stage providing a gain of 2.5. It also transfers the analog output signal from a reference with the internal power source to the floating ±18 V source used on the option board. This enables the output to be truly floating.

PERFORMANCE SPECIFICATIONS FOR ANALOG OUTPUT OPTION

DC Gain:	10 V output equal to thermocouple full scale. Variable from 50 to 1000 by installation of a fixed precision resistor.
Gain Accuracy:	± 0.1%
Gain Stability:	0.004% of setting per ^{o}C if gain resistor is precision wire-wound with a tempco of 10 ppm or better.
Bandwidth:	Limited to 10 Hz.
Input offset voltage:	±5 microvolts with an output of ±10 V from analog outputs. Adjustable with R47.
Zero Stability:	2 microvolts/^{o}C maximum.
Zero Stability With Time:	Better than ±5 microvolts at input per 1000 hours.
Input Bias Current:	Compensated to 10 nanoamps. Variation in temperature = less than 0.5 nanoamps/^{o}C max.
Input noise:	DC to 10 Hz = 1.5 microvolts p/p.
Input Impedance:	Greater than 10 megohms.
Input Protection:	Accomplished with fuse on option board and clamping diodes. 100 VDC or 115 VAC continuous at input with no damage.
Output Characteristics:	Short circuit proof, differential or isolated. Grounded output will not deteriorate the CMR of the DS-350 to less than 120 db. The output may be shorted indefinitely to output ground. Short circuit current limited to ±12 ma. Slew rate is 0.2V/microsecond output wide band noise of 1 mv RMS maximum.
Common Mode Characteristics:	Allowable limits of ±9 V. Common mode rejection ratio is 70 db at 59 Hz with 100 ohm unbalance in either the Hi or Lo lead with a system gain of 100.
Warm-up Time:	Initial warm-up time of two hours minimum.

MANUAL ADDENDUM 350-4410-00

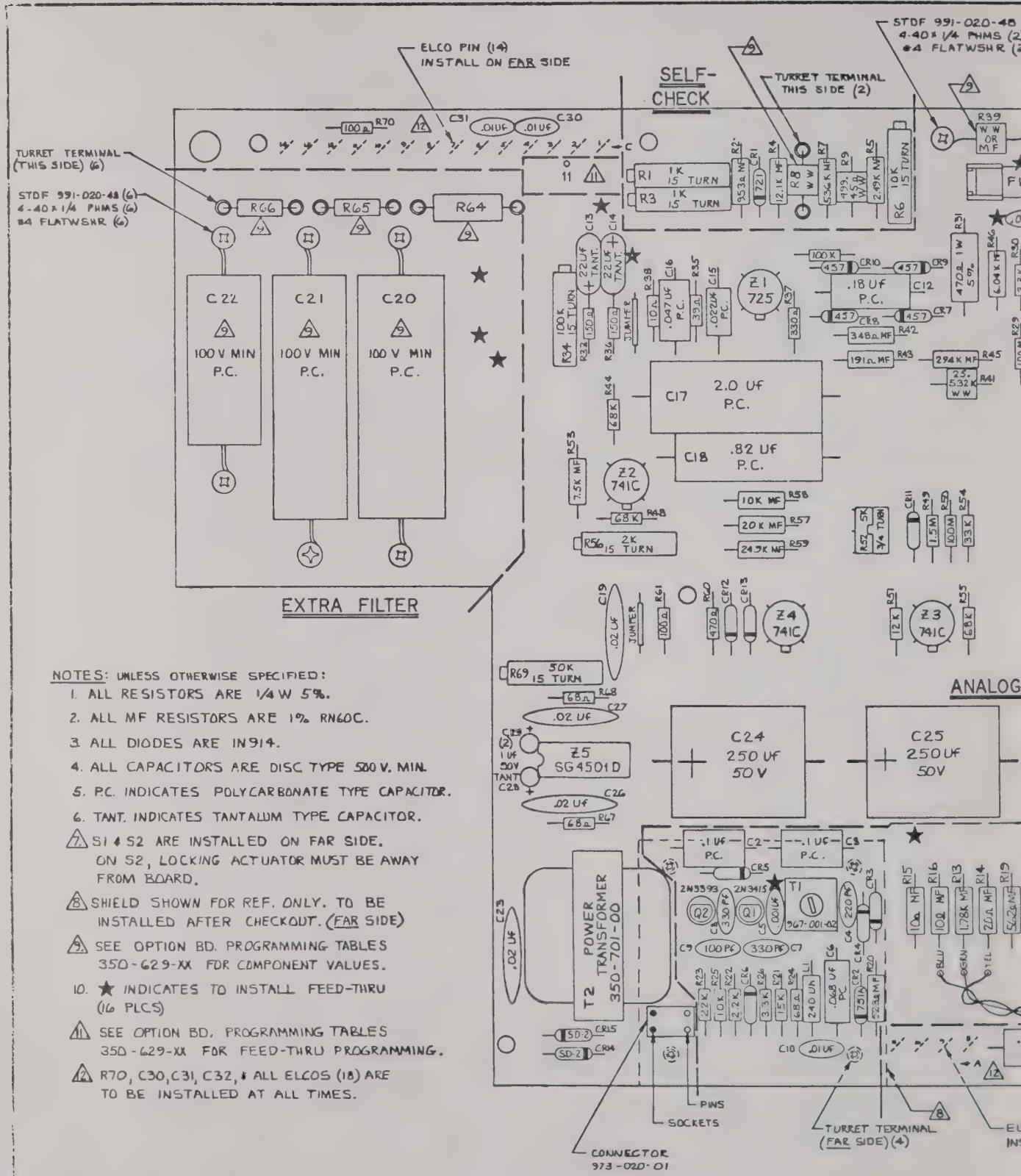
MODEL DS-350, DIGITAL THERMOCOUPLE INDICATOR

EXTRA FILTER OPTION

The extra filter option will allow field solutions for increased NMR at frequencies other than 60 Hz. The standard 350 notch filter must be removed when this option is used. The maximum capacity allowed will be limited to 10 mfd polycarbonate to keep soakage to a minimum. The filter is a three-pole passive type.

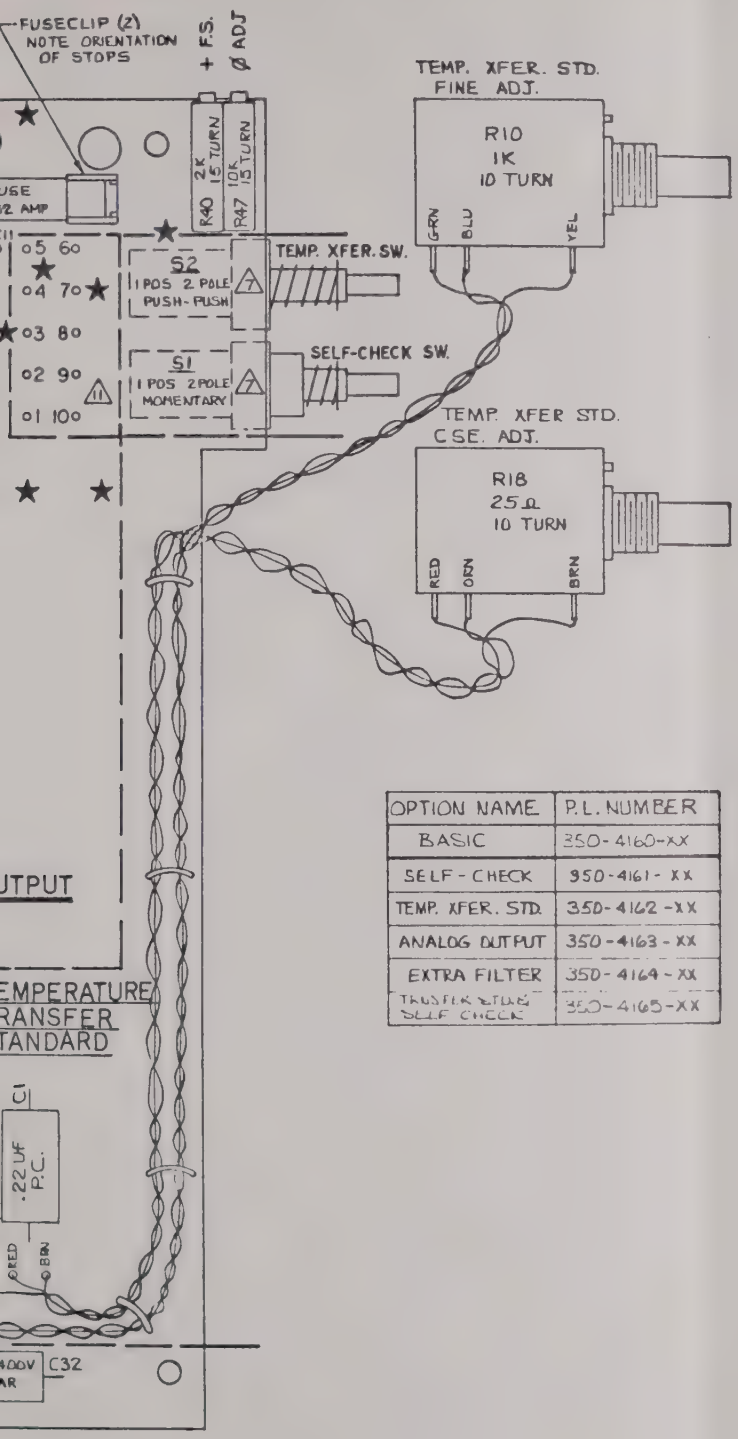
As a guideline for field installation, the following resistor and capacitor values are offered for selected frequencies.

Approximate Cutoff Frequency	Resistors 5% Carbon			Capacitors Polycarbonate 100 V Min 10%		
	R64 1W	R65 .5W	R66 .5W	C20	C21	C22
10 Hz	15K	33K	68K	1 UF	.47UF	.22 UF
5 Hz	15K	33K	68K	2 UF	1 UF	.47 UF
2 Hz	15K	33K	39K	4 UF	2 UF	2 UF
1 Hz	15K	39K	75K	10 UF	4 UF	2 UF



NOTES: UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTORS ARE 1/4 W 5%.
2. ALL MF RESISTORS ARE 1% RN60C.
3. ALL DIODES ARE IN914.
4. ALL CAPACITORS ARE DISC TYPE 500 V. MIN.
5. P.C. INDICATES POLYCARBONATE TYPE CAPACITOR.
6. TANT. INDICATES TANTALUM TYPE CAPACITOR.
7. S1 & S2 ARE INSTALLED ON FAR SIDE. ON S2, LOCKING ACTUATOR MUST BE AWAY FROM BOARD.
8. SHIELD SHOWN FOR REF. ONLY. TO BE INSTALLED AFTER CHECKOUT. (FAR SIDE)
9. SEE OPTION BD. PROGRAMMING TABLES 350-629-XX FOR COMPONENT VALUES.
10. ★ INDICATES TO INSTALL FEED-THRU (16 PLCS)
11. SEE OPTION BD. PROGRAMMING TABLES 350-629-XX FOR FEED-THRU PROGRAMMING.
12. R70, C30, C31, C32, & ALL ELCOS (18) ARE TO BE INSTALLED AT ALL TIMES.

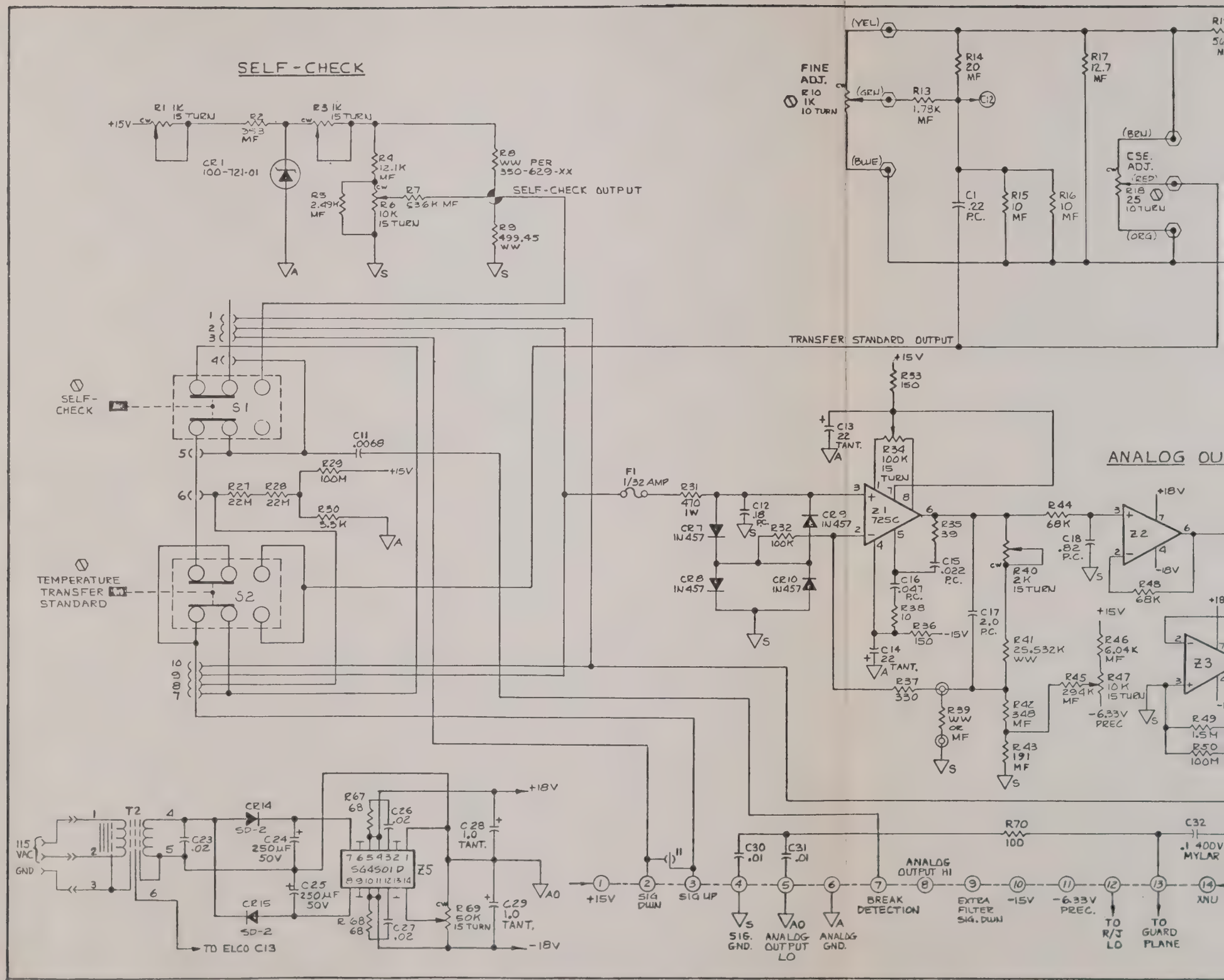


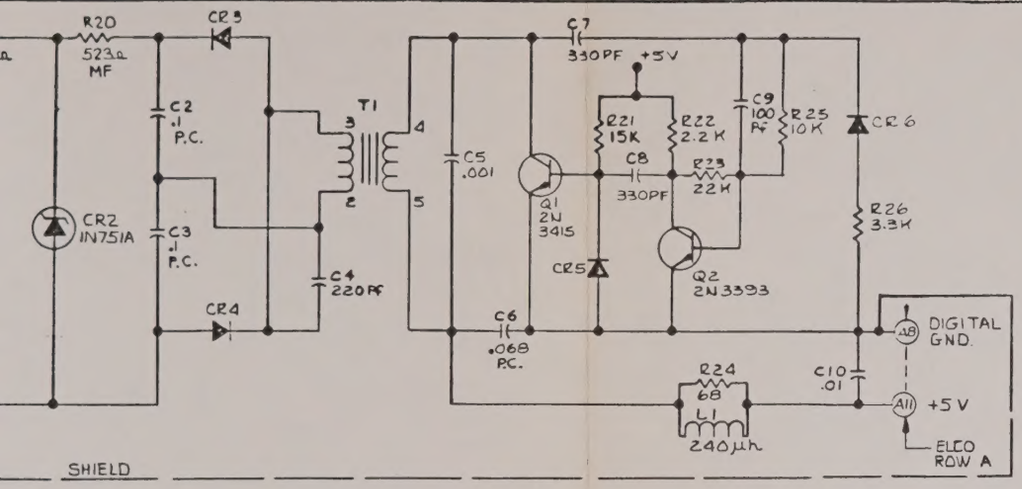
OPTION NAME	P.L. NUMBER
BASIC	350-4160-XX
SELF-CHECK	350-4161-XX
TEMP. XFER. STD.	350-4162-XX
ANALOG OUTPUT	350-4163-XX
EXTRA FILTER	350-4164-XX
TRANSFER STD. & SELF CHECK	350-4165-XX

1181.1199	04	F	PER ECN C
1100	03	E	CHGD DWG REF ECN
1100	03	D	REVISED PER ECN
—	02	C	RELEASED
—	01	B	CHGD PER DSR 01170
—	00	A	RELEASED

OPTION PCB ASSY
DS-350

350-416X-04 F


SELF-CHECK
R1 1K 15 TURN
R2 353 MF
R3 1K 15 TURN
CR1 100-721-01
R4 12.1K MF
R5 2.49K MF
R6 10K 15 TURN
R7 536K MF
R8 WW PER 350-629-XX
R9 499.45 WW
SELF-CHECK OUTPUT
+15V
A
S
FINE ADJ. R10 1K 10 TURN
(YEL)
(GRN)
(BLUE)
R13 1.78K MF
R14 20 MF
R15 10 MF
R16 10 MF
R17 12.7 MF
C1 .22 P.C.
C12
CSE. ADJ.
(BRN)
(RED)
(ORG)
R18 25 10 TURN
TRANSFER STANDARD OUTPUT
SELF-CHECK
S1
TEMPERATURE TRANSFER STANDARD
S2
C11 .0068
R29 100M
R27 22M
R28 22M
R30 5.5K
F1 1/32 AMP
R31 470 1W
CR7 IN457
CR8 IN457
C12 .18 P.C.
R32 100K
CR9 IN457
CR10 IN457
+15V
R33 150
C13 22 TANT.
R34 100K 15 TURN
Z1 725C
R35 39
C15 .022 P.C.
C16 .047 P.C.
R38 10
R36 150
-15V
C14 22 TANT.
R37 330
C17 2.0 P.C.
R40 2K 15 TURN
R41 25.532K WW
R42 348 MF
R43 191 MF
R39 WW OR MF
R44 68K
C18 .82 P.C.
Z2
+18V
-18V
R48 68K
ANALOG OU
R46 6.04K MF
R45 294K MF
R47 10K 15 TURN
-6.33V PREC
Z3
R49 1.5M
R50 100M
T2
115 VAC
GND
CR14 SD-2
CR15 SD-2
C23 .02
C24 250µF 50V
C25 250µF 50V
R67 68
C26 .02
R68 68
C27 .02
Z5
SG4501D
R69 50K 15 TURN
C28 1.0 TANT.
C29 1.0 TANT.
TO ELCO C13
A0
R70 100
C32 .1 400V MYLAR
C30 .01
C31 .01
1 +15V
2 SIG DWN
3 SIG UP
4 S SIG. GND.
5 A0 ANALOG OUTPUT LO
6 A ANALOG GND.
7 BREAK DETECTION
8 ANALOG OUTPUT HI
9 EXTRA FILTER SIG. DWN
10 -15V
11 -6.33V PREC.
12 TO R/J LO
13 TO GUARD PLANE
14 XNU



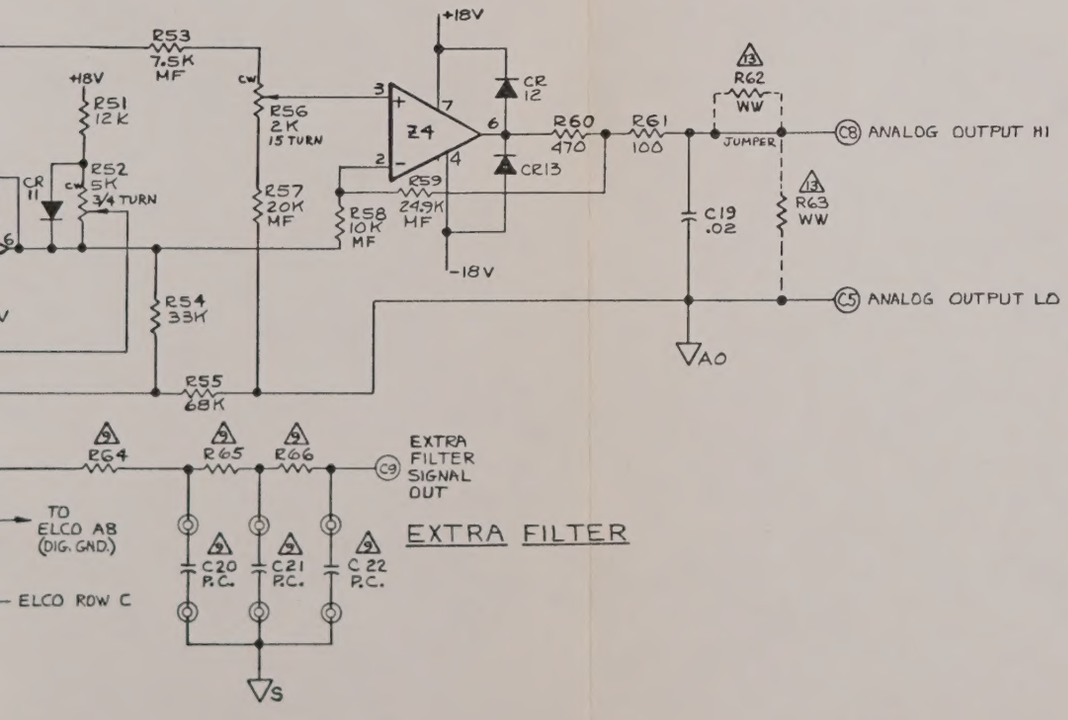
TEMPERATURE TRANSFER STANDARD

REFERENCE DESIGNATORS	
REF DES LAST USED	DELETED NOT TO BE REUSED
R70	R11, R12
C32	
CR15	
Z5	
Q2	
S2	
T2	
L1	
F1	
F/T 11	

NOTES: UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTORS ARE 1/4W 5% CARBON
2. "MF" INDICATES METAL FILM 1% RNGOC
3. "WW" INDICATES WIRE WOUND .05%
4. ALL DIODES ARE IN914.
5. ALL OP-AMPS ARE 741C.
6. "P.C." INDICATES POLYCARBONATE CAPACITOR.
7. ALL CAPACITORS ARE DISC 500 WVDC MIN; UNITS IN μf.
8. "-ϕ" INDICATES PROGRAMMING FEEDTHRU, SEE 350-629-XX FOR PROGRAMMING.
9. SEE 350-629-XX FOR VALUES
10. "Ⓥ" INDICATES A FRONT PANEL CONTROL.
11. "◔" INDICATES A SUMMING JUNCTION.
12. ALL CAPACITOR VALUES IN Uf; ALL RESISTOR VALUES IN OHMS.
13. R62 & R63 OPTIONAL, VALUES UNDETERMINED

PUT



EXTRA FILTER

1187	02	C	CHG'D CATHODE END OF CR4	11-28-83	DC
1100	01	B	CHG'D TRANS STD	9-1-83	JC
"	00	A	RELEASED	7-6-83	JB

DORIC SCIENTIFIC

SCHEMATIC
DS-350 OPTIONS

L. OPTEDAHL 6-29-83

L. OPTEDAHL 7-11-83

SCHEMATIC

S. CARSTENS 7-11-83

1 : 1

350-6160-02 C